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1 Metal Airplane Development Work. One complete set of wings, four panels, for a JN-4B airplane, has been fabricated and forwarded to McCook Field, Dayton, Ohio, for test. The wing beams are made of aluminum alloy, the ribs and other parts being of steel. The ailerons are constructed entirely of steel. These wings will be tested in flight.

One set of four beams, one of each size, has been heat treated at the Snead Iron Works after fabrication. These beams are being tested under combined bending and axial load to determine their strength. A rough test on similar beams shows the high modulus of rupture of 130,000 lb. per sq. in.

Special sheet steel, heat-treated for use in connection with steel airplane construction, developed an ultimate strength of 165,000 lb. per sq. in. with elongation of 3-1/2 per cent in 2 in.

A new light aluminum alloy containing silver and copper was tested in tension and bending, to determine its suitability as a material for airplane construction. Its ultimate strength in the cast form averaged about 16,000 lb. per sq. in. with 12 per cent elongation. Rolled and drawn, its ultimate strength averaged about 32,000 lb. per sq. in. with elongation of less than 5 per cent for rolled and 1.6 per cent for drawn material.

2 Cummings Tension Meter. The Cummings tension meter, an instrument recently offered for determining the tension in airplane cables, was investigated. Investigation showed that the instrument is not accurate unless carefully operated and calibrated for each position of the instrument and for each size of wire. Its accuracy, moreover, is not satisfactory at high loads, while its capacity is only one-half the maximum load required. The use of tables and curves is necessary to evaluate the results.

3 Brinnell Hardness Meter. An investigation of the Brinnell meter, a hand operated apparatus for determining hardness, has been completed. The results show that with a proper selection of the standard bar, an accuracy of within 5 per cent can be obtained.

4 Tests of Wood. Nineteen airplane wing beams, some solid, some of built-up construction, some with and some without splices, were tested for the Naval Aircraft Factory of Philadelphia, Pa. The results showed that the built-up and spliced beams were equal to the solid beams in respect to strength under transverse loads.

The study of the volume changes in mahogany with changes in the moisture content has just been completed. It appears that all species tested are affected about equally in amount by given changes in the moisture content, but that true mahogany absorbs moisture much more slowly than the other species.

Samples of the following woods were tested to determine their characteristics as possible materials for airplane construction. Tupelo wood was found to be deficient in strength excessive in weight and high in moisture content. Spanish Cedar was found to be satisfactory in respect to weight and uniformity of structure, but was low in strength compared with other available woods. Brazilian Walnut, a hard and tough material similar to black walnut, was found to be rather heavy but had a correspondingly high specific strength.

A number of tests were made on veneer boards for the Signal Corps to determine the waterproof qualities of the panels.

An investigation was made on the following processes for drying cypress: Fish's vulcanizing process showed possibilities, but results were not conclusive, due to poor operating conditions at the plant. Banks' process showed satisfactory drying but resulting material was weak. Whether this weakness was due to poor raw material or to the operation of the process has not been determined. The Marr process showed no change in strength or weight properties as compared with air-dried material.

5 Physical Tests of Miscellaneous Materials. Samples of the soft copper wire used in the Livens Projector were subjected to a shear test. Tensile, hardness and oil soakage tests were made on samples of hard fibre, comparisons being made between French and American products. 5-ton Duff jacks and 7-1/2-ton Simplex jacks were tested. The former showed a factor of safety of more than 4, the latter, a factor of less than 2. A factor of safety of 2 is considered sufficient. Mess spoons and forks were tested and specifications drawn. Baling bands, fastened with Brooks seals, tested in tension, showed an efficiency of the seals of 53 per cent.

Compression tests were made on cast steel wheels for gun carriages, determinations being made on the effect of welded and unwelded rim cracks on the strength of the wheel. The results of the tests showed but a small increase in strength due to welding of the cracks.

Physical tests were also made on two 1000-meter oxygen tanks; on steel reinforcing bars, manganese steel bars, machetes, sash chain, zinc for battery linings, wire cables for radio work, heat treated bolts and lock nuts, heat treated turnbuckles, ash and hickory trench spade handles, compression grease cups of sheet metal, bakelite insulation, powder containers, uniform buttons, recoil piston rod for 6" gun carriage, malleable iron truck wheels, manila rope and nickel steel calibration bars.

6 Effect of Compression Upon Textile Fibres. At the request of the Quartermaster General, an investigation was made of the effect of baling underwear under high pressure. A bale of cotton shirts was reduced in volume in the ratio of 2.2 to 1 under a pressure of sixty-five pounds per square inch, being left in this condition for one hundred and sixty-eight hours.

The strength of the garments as then determined by use of the Mullen tester showed that no harmful effect had been produced by the baling. The test included also the soaking of a compressed bale in water for forty-eight hours, the bale then being allowed to dry in the compressed condition. No injurious effects on the structure of the material were observed.

7 Measurements of Strength of Radio Signals. A method has been developed for measuring the strength of received radio signals. The receiving apparatus is alternately connected so as to receive incoming signals and to a known source of voltage of the proper frequency. By this means the relative strength of the incoming signals can be determined, and a comparison of the characteristics of different receiver sets can also be made by direct substitution.

8 Insulating Materials for Radio Apparatus. A preliminary report of the investigation of insulating materials used in the construction of radio apparatus has been prepared and copies furnished to the War and Navy Departments and to the manufacturers. The work has been limited chiefly to the three materials which are most widely used for such work. They are: Formica, Bakelike-Dilecto and Bakelite-Micarta. As other data are accumulated, supplementary reports will be issued until the work is complete.

9 Method of Determining Constants of Amplifying Tubes. An improved method has been developed for a more rapid determination of the constants of amplifying tubes. The method depends upon the principle of the alternating current potentiometer. The alternating current as applied to the grid is measured directly as is also the alternating component of the plate-voltage. Other characteristics of the tube can also be readily determined. A description of the method has been prepared and will be published shortly in the Proceedings of the Institute of Radio Engineers.

10 Velocity of Projectiles. For the past several months, the Bureau has been cooperating with the Sandy Hook and Aberdeen Proving Grounds on the problem of the rapid and accurate determination of the velocity of projectiles. For a few months an electrical engineer representing the Proving Ground, was stationed at the Bureau, and members of the Bureau cooperated with him in a preliminary laboratory study of various methods for the measurement of velocities, accompanying him on trips to the Proving Ground for field trials.

The work has been developed to such a point that the investigation has been transferred to Aberdeen and Philadelphia. The method of velocity determination finally decided upon has been called the "Aberdeen Method", and is now on a production basis, 20 sets being nearly ready for use at Aberdeen and in France. Arrangements of the electrical circuits for the

recording part of the method were worked out at the Bureau.
Recently a master direct-reading scale for this work was ruled at the Bureau, and in actual service was found to enable final results to be obtained in ten seconds.

11 Experiments on the Wind Pressure on Wires. While the present tables for the wind pressure upon a single wire are regarded as sufficiently accurate for all practical purposes, there has been considerable question as to the accuracy of these formulas for wires strung closely parallel, particularly when in considerable groups. The Bureau has, therefore, undertaken an experimental study of the wind pressures upon wires when grouped. Experiments have already been carried out in the wind tunnel and the results obtained will be checked by further experiments in the open air.

12 Telephone Service. In connection with the local telephone case, the Bureau has sent out a questionnaire to users of automatic telephone equipment in order to secure data on actual service experience of different classes of users. Replies to these questionnaires have been received from about 100 establishments, including commercial firms, government, federal, state and city institutions, and from city authorities and civic bodies in cities having public automatic telephone service.

13 Munitions Gages. 4688 munitions gages were tested during April, and 4889 during May, exclusive of field inspections and of inspections at a branch laboratory in New York City. Plans are now well under way for a considerable increase in the activities of the gage section by the establishment of a refinishing shop and laboratory for the salvaging of worn and obsolete gages for the Ordnance Department, U. S. Army. About 100 gages have been salvaged to date.

14 Special Tests of Weighing Scales. The Railroad track testing equipment of the Bureau was used in calibrating a track scale being employed for weighing in of material at a mid-western plant at which a special technical test relating to fuel modification was being carried on. For this purpose the scale was adjusted to give very accurate weighings and special instructions were drawn up for its use with this end in view. An inspection was made of the weighing and measuring devices at the request of the Medical Supply Depot at New York City by a member of the staff of the Bureau.

15 General Note: Specifications for Materials. The Bureau is in a position to give valuable service in the matter of developing suitable specifications for purchase of materials. The Bureau has already done extensive work in this regard in connection with ferrous and non-ferrous metals, paints, varnishes, airplane dopes, airplane fabrics, paper, leather, rubber products of every sort and a great variety of common materials regularly purchased by the Government Departments. The Bureau is ready to extend this type of work at any time to new materials or known materials adapted to new purposes.

Respectfully,

S. W. STRATTON,
Director.